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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/828,549	04/21/2004	Zheng-Hong Lu	14683	5455

293 7590 06/15/2006

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EXAMINER	
SANEI, HANA ASMAT	
ART UNIT	**PAPER NUMBER**
2879	

DATE MAILED: 06/15/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

8/

Office Action Summary	Application No.	Applicant(s)	
	10/828,549	LU ET AL.	
	Examiner	**Art Unit**	
	Hana A. Sanei	2879	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *04 November 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-61* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-61* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *21 April 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *8/10/04; 11/04/04*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Specification

Applicant is reminded of the proper format for an abstract of the disclosure.

The abstract should generally be limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. Appropriate correction is required.

Claim Objections

Claim 8 is objected to because of the following informalities: the phrase "trilayer" lacks proper antecedent basis. Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

1. Claims 1-3, 10-13, 15-19, 36-39, 41-42, 60-61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Burrows et al (US 5917280) in view of Tsutsui (US 2004/0027059 A1).

Regarding Claim 1, Burrows teaches a) a light-transmissive substrate (substantially transmissive substrate, 70, see at least Fig. 2); b) a light-transmissive first electrode layer (61); c) a first charge transport layer (62h); d) a light-emissive layer

(lower laminate of 64e, EL); e) a first charge injection electrode layer (thin layered portion of 65) on the light-emissive layer; f) a second charge transport layer (upper laminate of 68e, ETL); and g) a second electrode layer (69). Burrows fails to teach the first charge injection electrode layer being electrically floating.

In the same field of endeavor, Tsutsui teaches an organic electroluminescent device (see at least Fig. 1) having an electrode (104) being electrically floating in order to improve current efficiency of the organic electroluminescent device ([0032, 0035]). The electrode (thin layered portion of 65) of Burrows is in accordance with Tsutsui's embodiment in that Burrows's electrode is correspondingly formed between two electroluminescent layers, thereby sustaining a similarity in locality, in order to allow for an improvement of current efficiency to take place in Burrows's light emitting device.

Therefore, it would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify the electrode layer, as disclosed by Tsutsui, in the light emitting device of Burrows in order to improve current efficiency of the light emitting device

Regarding Claim 2, Burrows teaches that the first electrode layer is an anode electrode layer (61, Col. 4, lines 54-56), wherein the second electrode layer is a cathode electrode layer (69, Col. 5, lines 17-18), wherein the first charge transport layer is a hole transport layer (62h, HTL), wherein the second charge transport layer is an organic-based electron transport layer (68e, ETL, Col. 4, lines 59-60), and wherein the first embedded charge injection electrode layer (thin layered portion of 65) is formed of a low work function metal or metal alloy (Mg:Ag alloy, Col. 5, lines 1-2).

Regarding Claim 3, Burrows teaches the first embedded charge injection electrode layer (thin layered portion of 65) is formed of an alloy of Mg:Ag (Col. 5, lines 1-2).

Regarding Claim 10, Burrows teaches the organic electron-transport layer (upper laminate of 68e, ETL) is formed of electron-conductive organic molecules (Alq, Col. 6, lines 45-47).

Regarding Claim 11, Burrows teaches that the organic electron-transport layer has a thickness in a range from about 30 to about 300 nm (20 nm to 80 nm, Col. 6, lines 45-47).

Regarding Claim 12, Burrows teaches that the cathode electrode layer (69) is made of a Ag (Mg:Ag alloy, Col. 5, lines 17-20).

Regarding Claim 13, Burrows teaches that the anode electrode layer (61) is made of ITO (Col. 4, lines 56-57).

Regarding Claim 15, Burrows teaches a second charge injection electrode layer (upper layer of 63) between the light-emissive layer and the hole transport layer. Burrows fails to teach the first charge injection electrode layer being electrically floating.

In the same field of endeavor, Tsutsui teaches an organic electroluminescent device (see at least Fig. 1) having an electrode (104) being electrically floating in order to improve current efficiency of the organic electroluminescent device ([0032, 0035]). The electrode (upper layer of 63) of Burrows is in accordance with Tsutsui's embodiment in that Burrows's electrode is correspondingly formed between two

electroluminescent layers, thereby sustaining a similarity in locality, in order to allow for an improvement of current efficiency to take place in Burrows's light emitting device.

Therefore, it would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify the electrode layer, as disclosed by Tsutsui, in the light emitting device of Burrows in order to improve current efficiency of the light emitting device

Regarding Claim 16, Burrows teaches that the second embedded charge injection electrode layer (upper layer of 63) is formed of a material selected from the group consisting of high work function metals and metal oxides (ITO, Col. 4, lines 63-65).

Regarding Claim 17, Burrows teaches that the second embedded charge injection electrode layer (upper layer of 63) is formed of indium tin oxide (ITO, Col. 4, lines 63-65).

Regarding Claim 18, Burrows teaches that the organic electron-transport layer (upper laminate of 68e, ETL) is formed of electron-conductive organic molecules such as Alq (Alq, Col. 6, lines 45-47).

Regarding Claim 19, Burrows teaches that a thickness of the first embedded charge injection electrode (thin layered portion of 65, thickness: 5 - 20 nm, Col. 6, lines 50-52) and a thickness of the electron-transport layer (68e, ETL, 20 – 80 nm, Col. 6, lines 45-47) are selected to give destructive interference of pre-selected wavelengths of light. Examiner is utilizing the thicknesses as disclosed in applicant's specification to

ensure that the inherency of a destructive interference results by attaining the disclosed thicknesses thereof.

Regarding Claim 36, Burrows teaches a) a light-transmissive substrate (substantially transmissive substrate, 70, see at least Fig. 2); b) a light-transmissive first electrode layer (61); c) a hole transporting layer (62h); d) a first charge injection electrode layer (upper layer of 63) on the hole-transporting layer e) a light-emissive layer (lower laminate of 64e, EL); f) a organic electron transport layer (Alq, upper laminate of 68e, ETL); and g) a cathode electrode layer (69). Burrows fails to teach the first charge injection electrode layer being electrically floating.

In the same field of endeavor, Tsutsui teaches an organic electroluminescent device (see at least Fig. 1) having an electrode (104) being electrically floating in order to improve current efficiency of the organic electroluminescent device ([0032, 0035]). The electrode (thin layered portion of 65) of Burrows is in accordance with Tsutsui's embodiment in that Burrows's electrode is correspondingly formed between two electroluminescent layers, thereby sustaining a similarity in locality, in order to allow for an improvement of current efficiency to take place in Burrows's light emitting device.

Therefore, it would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify the electrode layer, as disclosed by Tsutsui, in the light emitting device of Burrows in order to improve current efficiency of the light emitting device.

Regarding Claim 37, Burrows teaches a second charge injection electrode layer (thin layered portion of 65) between the light-emissive layer and the electron transport

layer. Burrows fails to teach the first charge injection electrode layer being electrically floating.

In the same field of endeavor, Tsutsui teaches an organic electroluminescent device (see at least Fig. 1) having an electrode (104) being electrically floating in order to improve current efficiency of the organic electroluminescent device ([0032, 0035]). The electrode (upper layer of 63) of Burrows is in accordance with Tsutsui's embodiment in that Burrows's electrode is correspondingly formed between two electroluminescent layers, thereby sustaining a similarity in locality, in order to allow for an improvement of current efficiency to take place in Burrows's light emitting device.

Therefore, it would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify the electrode layer, as disclosed by Tsutsui, in the light emitting device of Burrows in order to improve current efficiency of the light emitting device.

Regarding Claim 38, Burrows teaches that the first embedded charge injection electrode layer (upper layer of 63) is formed of a material selected from the group consisting of high work function metals and metal oxides (ITO, Col. 4, lines 63-65).

Regarding Claim 39, Burrows teaches that the first embedded charge injection electrode layer (upper layer of 63) is formed of indium tin oxide (ITO, Col. 4, lines 63-65).

Regarding Claim 41, Burrows teaches that the second embedded charge injection electrode layer (thin layered portion of 65) is formed of a low work function metal or metal alloy (Mg:Ag alloy, Col. 5, lines 1-2).

Regarding Claim 42, Burrows teaches the second embedded charge injection electrode layer (thin layered portion of 65) is formed of an alloy of Mg:Ag (Col. 5, lines 1-2).

Regarding Claim 60, Burrows teaches a power supply means connected between the anode electrode layer and the cathode electrode layer for applying a pre-selected voltage across the anode electrode layer and the cathode electrode layer and all layers therebetween (refer to at least Fig. 2, vB).

Regarding Claim 61, Burrows teaches that the light emissive layer is produced using any one of organic based fluorescent molecules (Alq_3, Col. 6, lines 58-59).

2. Claims 4-5, 8-9, 43-44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Burrows et al (US 5917280) in view of Tsutsui (US 2004/0027059 A1) in further view of Mori et al (US 2004/0028944 A1).

Regarding Claim 4, Burrows-Tsutsui teaches the invention set forth above (see rejection in Claim 1 above). Burrows-Tsutsui fails to teach the first embedded charge injection electrode layer being formed of a bi-layer of alkali fluoride/metal.

In the same field of endeavor, Mori teaches light emitting device with a charge injection electrode layer (cathode, [0107]) being formed of a bi-layer of alkali fluoride/metal (LiF/Al, [0107]) wherein the charge injection electrode layer is provided as a bi-layer of alkali fluoride/metal (LiF/Al, [0107]) or Mg:Al ([0042]), thus exemplifying recognized equivalent materials of the charge injection electrode layer in the art.

Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the charge injection electrode layer of a bi-layer

of alkali fluoride/metal as suitable instead of as Mg:Al, since the selection of any of these known equivalents would be considered within the level of ordinary skill in the art as evidenced by Mori's teaching.

Regarding Claim 5, Burrows-Tsutsui-Mori teaches the bi-layer of alkali fluoride/metal is LiF/Al (LiF/Al, [0107] of '944).

Regarding Claim 8, Burrows-Tsutsui-Mori teaches that the metal layers in the bilaryers have a thickness in a range from 2 nm to 30 nm (2.6 nm, [0107] of '944).

Regarding Claim 9, Burrows-Tsutsui-Mori teaches that the alkali fluoride layer thickness is in the range from about 0.2 to 1 nm (0.6 nm, [0107] of '944].

Regarding Claim 43, Burrows-Tsutsui teaches the invention set forth above (see rejection in Claim 1 above). Burrows-Tsutsui fails to teach the first embedded charge injection electrode layer being formed of a bi-layer of alkali fluoride/metal.

In the same field of endeavor, Mori teaches light emitting device with a charge injection electrode layer (cathode, [0107]) being formed of a bi-layer of alkali fluoride/metal (LiF/Al, [0107]) wherein the charge injection electrode layer is provided as a bi-layer of alkali fluoride/metal (LiF/Al, [0107]) or Mg:Al ([0042]), thus exemplifying recognized equivalent materials of the charge injection electrode layer in the art.

Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the charge injection electrode layer of a bi-layer of alkali fluoride/metal as suitable instead of as Mg:Al, since the selection of any of these known equivalents would be considered within the level of ordinary skill in the art as evidenced by Mori's teaching.

Regarding Claim 44, Burrows-Tsutsui-Mori teaches the bi-layer of alkali fluoride/metal is LiF/Al (LiF/Al, [0107] of '944).

3. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Burrows et al (US 5917280) in view of Tsutsui (US 2004/0027059 A1) in further view of Aziz et al (US 2002/0180349 A1).

Regarding Claim 14, Burrows-Tsutsui teaches the invention set forth above (see rejection in Claim 1 above). Burrows-Tsutsui lacks a cathode capping layer.

In the same field of endeavor, Aziz teaches an organic light emitting device with a cathode capping layer made of a dielectric such as Si oxide (capping region, formed on cathode [0198]) in order to protect the light emitting device from ambient conditions ([0198]).

Therefore, it would have been obvious to one of ordinary skill in the art, at the time of the invention, to add the cathode capping layer, as disclosed by Aziz, in the light emitting device of Burrows-Tsutsui in order to protect the light emitting device from ambient conditions.

4. Claims 20-25, 32-33, 46-47, 53-54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Burrows et al (US 5917280) in view of Tsutsui (US 2004/0027059 A1) in further view of Kwong et al (US 2002/0074935 A1).

Regarding Claim 20, Burrows teaches a) a substrate (70, see at least Fig. 2); b) an anode electrode layer (61); c) a hole transport layer (62h); d) a light-emissive layer (lower laminate of 64e, EL); e) a first charge injection electrode layer (thin layered portion of 65) on the light-emissive layer; f) an organic electron transport layer (Alq,

upper laminate of 68e, ETL); and g) a cathode (69). Burrows fails to teach the first charge injection electrode layer being electrically floating.

In the same field of endeavor, Tsutsui teaches an organic electroluminescent device (see at least Fig. 1) having an electrode (104) being electrically floating in order to improve current efficiency of the organic electroluminescent device ([0032, 0035]). The electrode (thin layered portion of 65) of Burrows is in accordance with Tsutsui's embodiment in that Burrows's electrode is correspondingly formed between two electroluminescent layers, thereby sustaining a similarity in locality, in order to allow for an improvement of current efficiency to take place in Burrows's light emitting device.

Therefore, it would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify the electrode layer, as disclosed by Tsutsui, in the light emitting device of Burrows in order to improve current efficiency of the light emitting device

Burrows-Tsutsui fails to teach the light-emitting device as a top emitting. In the same field of endeavor, Kwong teaches an organic light emitting device wherein the device is provided as top emitting or bottom emitting ([0053]), thus exemplifying recognized equivalent materials of the device in the art. Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the light emitting device of Burrows-Tsutsui as top emitting instead of as bottom emitting, since the selection of any of these known equivalents would be considered within the level of ordinary skill in the art as evidenced by Kwong's teaching.

Accordingly, Kwong teaches an optically reflective anode electrode layer and a light transmissive cathode electrode layer ([0053]).

Regarding Claim 21, Burrows teaches the organic electron-transport layer (upper laminate of 68e, ETL) is formed of electron-conductive organic molecules (Alq, Col. 6, lines 45-47).

Regarding Claim 22, Burrows teaches that the organic electron-transport layer (upper laminate of 68e, ETL) is formed of electron-conductive organic molecules such as Alq (Alq, Col. 6, lines 45-47).

Regarding Claim 23, Burrows teaches that the organic electron-transport layer has a thickness in a range from about 30 to about 300 nm (20 nm to 80 nm, Col. 6, lines 45-47).

Regarding Claim 24, Burrows teaches that the first embedded charge injection electrode layer (thin layered portion of 65) is formed of a low work function metal or metal alloy (Mg:Ag alloy, Col. 5, lines 1-2).

Regarding Claim 25, Burrows teaches the first embedded charge injection electrode layer (thin layered portion of 65) is formed of an alloy of Mg:Ag (Col. 5, lines 1-2).

Regarding Claim 32, Burrows teaches that the cathode electrode layer (69) is made of a Ag (Mg:Ag alloy, Col. 5, lines 17-20).

Regarding Claim 33, Burrows teaches that metal layer has a thickness in a range from 15 nm to 300 nm (50 nm to 200 nm; Col. 7, lines 12-13).

Regarding Claim 46, Burrows teaches a) a substrate (70, see at least Fig. 2); b) an anode electrode layer (61); c) a hole transport layer (62h); d) a first charge injection electrode layer (layer of 63) on hole transport layer; e) a light-emissive layer (lower laminate of 64e, EL); f) an organic electron transport layer (Alq, upper laminate of 68e, ETL); and g) a cathode (69). Burrows fails to teach the first charge injection electrode layer being electrically floating.

In the same field of endeavor, Tsutsui teaches an organic electroluminescent device (see at least Fig. 1) having an electrode (104) being electrically floating in order to improve current efficiency of the organic electroluminescent device ([0032, 0035]). The electrode (layer of 63) of Burrows is in accordance with Tsutsui's embodiment in that Burrows's electrode is correspondingly formed between two electroluminescent layers, thereby sustaining a similarity in locality, in order to allow for an improvement of current efficiency to take place in Burrows's light emitting device.

Therefore, it would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify the electrode layer, as disclosed by Tsutsui, in the light emitting device of Burrows in order to improve current efficiency of the light emitting device

Burrows-Tsutsui fails to teach the light-emitting device as a top emitting. In the same field of endeavor, Kwong teaches an organic light emitting device wherein the device is provided as top emitting or bottom emitting ([0053]), thus exemplifying recognized equivalent materials of the device in the art. Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide

the light emitting device of Burrows-Tsutsui as top emitting instead of as bottom emitting, since the selection of any of these known equivalents would be considered within the level of ordinary skill in the art as evidenced by Kwong's teaching. Accordingly, Kwong teaches a transmissive cathode electrode layer ([0053]).

Regarding Claim 47, Burrows teaches a second charge injection electrode layer (layer of 65) between the light-emissive layer and the electron transport layer. Burrows fails to teach the first charge injection electrode layer being electrically floating.

In the same field of endeavor, Tsutsui teaches an organic electroluminescent device (see at least Fig. 1) having an electrode (104) being electrically floating in order to improve current efficiency of the organic electroluminescent device ([0032, 0035]). The electrode (upper layer of 63) of Burrows is in accordance with Tsutsui's embodiment in that Burrows's electrode is correspondingly formed between two electroluminescent layers, thereby sustaining a similarity in locality, in order to allow for an improvement of current efficiency to take place in Burrows's light emitting device.

Therefore, it would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify the electrode layer, as disclosed by Tsutsui, in the light emitting device of Burrows in order to improve current efficiency of the light emitting device.

Regarding Claim 53, Burrows teaches that the second embedded charge injection electrode layer (thin layered portion of 65) is formed of a low work function metal or metal alloy (Mg:Ag alloy, Col. 5, lines 1-2).

Regarding Claim 54, Burrows teaches the second embedded charge injection electrode layer (thin layered portion of 65) is formed of an alloy of Mg:Ag (Col. 5, lines 1-2).

5. Claim 34 is rejected under 35 U.S.C. 103(a) as being unpatentable over Burrows et al (US 5917280) in view of Tsutsui (US 2004/0027059 A1) in further view of Kwong et al (US 2002/0074935 A1) in further view of Aziz et al (US 2002/0180349 A1).

Regarding Claim 34, Burrows-Tsutsui-Kwong teaches the invention set forth above (see rejection in Claim 1 above). Burrows-Tsutsui-Kwong lacks a cathode capping layer.

In the same field of endeavor, Aziz teaches an organic light emitting device with a cathode capping layer made of a dielectric such as Si oxide (capping region, formed on cathode [0198]) in order to protect the light emitting device from ambient conditions ([0198]).

Therefore, it would have been obvious to one of ordinary skill in the art, at the time of the invention, to add the cathode capping layer, as disclosed by Aziz, in the light emitting device of Burrows-Tsutsui-Kwong in order to protect the light emitting device from ambient conditions.

6. Claims 26-27, 30-31, 55-56 are rejected under 35 U.S.C. 103(a) as being unpatentable over Burrows et al (US 5917280) in view of Tsutsui (US 2004/0027059 A1) in further view of Kwong et al (US 2002/0074935 A1) in further view of Mori et al (US 2004/0028944 A1).

Regarding Claim 26, Burrows-Tsutsui-Kwong teaches the invention set forth above (see rejection in Claim 1 above). Burrows-Tsutsui-Kwong fails to teach the first embedded charge injection electrode layer being formed of a bi-layer of alkali fluoride/metal.

In the same field of endeavor, Mori teaches light emitting device with a charge injection electrode layer (cathode, [0107]) being formed of a bi-layer of alkali fluoride/metal (LiF/Al, [0107]) wherein the charge injection electrode layer is provided as a bi-layer of alkali fluoride/metal (LiF/Al, [0107]) or Mg:Al ([0042]), thus exemplifying recognized equivalent materials of the charge injection electrode layer in the art.

Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the charge injection electrode layer of a bi-layer of alkali fluoride/metal as suitable instead of as Mg:Al, since the selection of any of these known equivalents would be considered within the level of ordinary skill in the art as evidenced by Mori's teaching.

Regarding Claim 27, Burrows-Tsutsui-Kwong-Mori teaches the bi-layer of alkali fluoride/metal is LiF/Al (LiF/Al, [0107] of '944).

Regarding Claim 30, Burrows-Tsutsui-Kwong-Mori teaches that the metal layers in the bilaryers have a thickness in a range from 2 nm to 30 nm (2.6 nm, [0107] of '944).

Regarding Claim 31, Burrows-Tsutsui-Kwong-Mori teaches that the alkali fluoride layer thickness is in the range from about 0.2 to 1 nm (0.6 nm, [0107] of '944].

Regarding Claim 55, Burrows-Tsutsui-Kwong teaches the invention set forth above (see rejection in Claim 1 above). Burrows-Tsutsui-Kwong fails to teach the first

embedded charge injection electrode layer being formed of a bi-layer of alkali fluoride/metal.

In the same field of endeavor, Mori teaches light emitting device with a charge injection electrode layer (cathode, [0107]) being formed of a bi-layer of alkali fluoride/metal (LiF/Al, [0107]) wherein the charge injection electrode layer is provided as a bi-layer of alkali fluoride/metal (LiF/Al, [0107]) or Mg:Al ([0042]), thus exemplifying recognized equivalent materials of the charge injection electrode layer in the art.

Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the charge injection electrode layer of a bi-layer of alkali fluoride/metal as suitable instead of as Mg:Al, since the selection of any of these known equivalents would be considered within the level of ordinary skill in the art as evidenced by Mori's teaching.

Regarding Claim 56, Burrows-Tsutsui-Kwong-Mori teaches the bi-layer of alkali fluoride/metal is LiF/Al (LiF/Al, [0107] of '944).

7. Claim 40 is rejected under 35 U.S.C. 103(a) as being unpatentable over Burrows et al (US 5917280) in view of Tsutsui (US 2004/0027059 A1) in further view of Epstein et al (US 5663573 A).

Regarding Claim 40, Burrows-Tsutsui teaches the invention set forth above (see rejection in Claim 36 above). Burrows-Tsutsui fails to teach the first embedded charge injection electrode layer being formed of graphitic carbon.

In the same field of endeavor, Epstein teaches an electroluminescent device wherein an electrode is provided as Indium Tin Oxide or graphite carbon (Col. 7, lines

56-61), thus exemplifying recognized equivalent materials of the electrode materials in the art.

Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the electrode of Burrows-Tsutsui as graphitic carbon instead of as Indium Tin Oxide, since the selection of any of these known equivalents would be considered within the level of ordinary skill in the art as evidenced by Epstein's teaching.

8. Claims 48-49, 50-51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Burrows et al (US 5917280) in view of Tsutsui (US 2004/0027059 A1) in further view of Kwong et al (US 2002/0074935 A1) in further view of Okazaki et al (US 2003/0062530 A1).

Regarding Claim 48, Burrows-Tsutsui-Kwong teaches the invention set forth above (see rejection in Claim 1 above). Burrows-Tsutsui-Kwong fails to the teach the first embedded charge injection electrode being formed of a highly reflective metal.

In the same field of endeavor, Okazaki teaches a light emitting device with an electrode being formed of a highly reflective metal ([0109]) in order to improve the external quantum efficiency ([0109] [0113]).

Therefore, it would have been obvious to one of ordinary skill in the art, at the time of the invention, to add the electrode, as disclosed by Okazaki, in the light emitting device of Burrows-Tsutsui-Kwong in order to improve the external quantum efficiency.

Regarding Claim 49, Burrows-Tsutsui-Kwong-Okazaki teaches that the highly reflective metal is aluminum ([0109] of '530).

Regarding Claim 50, Burrows-Tsutsui-Kwong-Okazaki teaches the first embedded charge injection electrode layer is formed of a material selected from the group consisting of high work function metals (silver, [0109] of '530).

Regarding Claim 51, Burrows-Tsutsui-Kwong-Okazaki teaches the first embedded charge injection electrode is formed of silver ([0109] of '530).

9. Claim 52 is rejected under 35 U.S.C. 103(a) as being unpatentable over Burrows et al (US 5917280) in view of Tsutsui (US 2004/0027059 A1) in further view of Kwong et al (US 2002/0074935 A1) in further view of Okazaki et al (US 2003/0062530 A1) in further view of Epstein et al (US 5663573 A).

Regarding Claim 52, Burrows-Tsutsui-Kwong-Okazaki teaches the invention set forth above (see rejection in Claim 46 above). Burrows-Tsutsui-Kwong-Okazaki fails to teach the first embedded charge injection electrode layer being formed of graphitic carbon.

In the same field of endeavor, Epstein teaches an electroluminescent device wherein an electrode is provided as silver or graphite carbon (Col. 7, lines 56-61), thus exemplifying recognized equivalent materials of the electrode materials in the art.

Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the electrode of Burrows-Tsutsui-Kwong-Okazaki as graphitic carbon instead of as silver, since the selection of any of these known equivalents would be considered within the level of ordinary skill in the art as evidenced by Epstein's teaching.

10. Claim 35, 59 are rejected under 35 U.S.C. 103(a) as being unpatentable over Burrows et al (US 5917280) in view of Tsutsui (US 2004/0027059 A1) in further view of Kwong et al (US 2002/0074935 A1) in further view of Song et al (US 2003/0122481 A1).

Regarding Claim 35, Burrows-Tsutsui-Kwong teaches the invention set forth above (see rejectio in Claim 20 above). Burrows-Tsutsui-Kwong fails to specifically teach that the thickness of the first embedded charge injection electrode and a thickness of the hole-transport layer and a thickness of the light-emissive layer are selected to give destructive interference of pre-selected wavelengths of light.

In the same field of endeavor, Song teaches the thickness of the electrode, hole transport layer and light-emissive layer ([0015-0016]) are selected to give destructive interference of pre-selected wavelengths of light in order to ensure that a difference in the luminance can be minimized for all colors of red, green and blue, thereby optimizing the color distribution ([0011], [0047]).

Therefore, it would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify the thicknesses, as disclosed by Song, in the of light emitting device of Burrows-Tsutsui-Kwong in order to ensure that a difference in the luminance can be minimized for all colors of red, green and blue, thereby optimizing the color distribution.

Regarding Claim 59, Burrows-Tsutsui-Kwong teaches the invention set forth above (see rejectio in Claim 46 above). Burrows-Tsutsui-Kwong fails to specifically teach that the thickness of the first embedded charge injection electrode and a

thickness of the hole-transport layer are selected to give destructive interference of pre-selected wavelengths of light.

In the same field of endeavor, Song teaches the thickness of the electrode, hole transport layer ([0016]) are selected to give destructive interference of pre-selected wavelengths of light in order to ensure that a difference in the luminance can be minimized for all colors of red, green and blue, thereby optimizing the color distribution ([0011], [0047]).

Therefore, it would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify the thicknesses, as disclosed by Song, in the of light emitting device of Burrows-Tsutsui-Kwong in order to ensure that a difference in the luminance can be minimized for all colors of red, green and blue, thereby optimizing the color distribution.

11. Claims 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Burrows et al (US 5917280) in view of Tsutsui (US 2004/0027059 A1) in further view of Song et al (US 2003/0122481 A1).

Regarding Claim 45, Burrows-Tsutsui teaches the invention set forth above (see rejectio in Claim 20 above). Burrows-Tsutsui fails to specifically teach that a thickness of the first embedded charge injection electrode and a thickness of the light emissive layer and the electron transport layer are selected to give destructive interference of pre-selected wavelengths of light.

In the same field of endeavor, Song teaches the thickness of the electrode, electron transport layer and light-emissive layer ([0015-0016]) are selected to give

destructive interference of pre-selected wavelengths of light in order to ensure that a difference in the luminance can be minimized for all colors of red, green and blue, thereby optimizing the color distribution ([0011], [0047]).

Therefore, it would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify the thicknesses, as disclosed by Song, in the of light emitting device of Burrows-Tsutsui in order to ensure that a difference in the luminance can be minimized for all colors of red, green and blue, thereby optimizing the color distribution.

12. Claims 6-7, are rejected under 35 U.S.C. 103(a) as being unpatentable over Burrows et al (US 5917280) in view of Tsutsui (US 2004/0027059 A1) in further view of Burroughes et al (WO 2000/048257 A1).

Regarding Claim 6, Burrows-Tsutsui teaches the invention set forth above (see rejection in Claim 1 above). Burrows-Tsutsui fails to teach the first embedded charge injection electrode being formed of a tri-layer of an alkaline fluoride/metal/metal

In the same field of endeavor, Burroughes an organic light emissive device with an electrode being formed of a tri-layer of an alkaline fluoride/metal/metal (LiF/Mg/Al, Pages 3-5) in order to improve the conditions for the charge injection into and change recombination in the emissive layer, thereby providing a significant increase in device efficiency (Page 2, Par. 1 & Page 7, Par. 4).

Therefore, it would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify the electrode, as disclosed by Burroughes, in the light emitting device of Burrows-Tsutsui in order to in order to improve the conditions for the

charge injection into and change recombination in the emissive layer, thereby providing a significant increase in device efficiency.

Regarding Claim 7, Burrows-Tsutsui-Burroughes teaches the tri-layer of a fluoride/metal/metal is LiF/Al/Mg (LiF/Mg/Al, Pages 3-5). The significance of Mg and Al locality is irrelevant as both are metals.

13. Claims 28-29, 57-58 are rejected under 35 U.S.C. 103(a) as being unpatentable over Burrows et al (US 5917280) in view of Tsutsui (US 2004/0027059 A1) in further view of Kwong et al (US 2002/0074935 A1) in further view of Burroughes et al (WO 2000/048257 A1).

Regarding Claim 28, Burrows-Tsutsui-Kwong teaches the invention set forth above (see rejection in Claim 1 above). Burrows-Tsutsui-Kwong fails to teach the first embedded charge injection electrode being formed of a tri-layer of an alkaline fluoride/metal/metal

In the same field of endeavor, Burroughes an organic light emissive device with an electrode being formed of a tri-layer of an alkaline fluoride/metal/metal (LiF/Mg/Al, Pages 3-5) in order to improve the conditions for the charge injection into and change recombination in the emissive layer, thereby providing a significant increase in device efficiency (Page 2, Par. 1 & Page 7, Par. 4).

Therefore, it would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify the electrode, as disclosed by Burroughes, in the light emitting device of Burrows-Tsutsui-Kwong in order to in order to improve the conditions

for the charge injection into and change recombination in the emissive layer, thereby providing a significant increase in device efficiency.

Regarding Claim 29, Burrows-Tsutsui-Kwong-Burroughes teaches the tri-layer of a fluoride/metal/metal is LiF/Al/Mg (LiF/Mg/Al, Pages 3-5). The significance of Mg and Al locality is irrelevant as both are metals.

Regarding Claim 57, Burrows-Tsutsui-Kwong teaches the invention set forth above (see rejection in Claim 1 above). Burrows-Tsutsui-Kwong fails to teach the first embedded charge injection electrode being formed of a tri-layer of an alkaline fluoride/metal/metal

In the same field of endeavor, Burroughes an organic light emissive device with an electrode being formed of a tri-layer of an alkaline fluoride/metal/metal (LiF/Mg/Al, Pages 3-5) in order to improve the conditions for the charge injection into and change recombination in the emissive layer, thereby providing a significant increase in device efficiency (Page 2, Par. 1 & Page 7, Par. 4).

Therefore, it would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify the electrode, as disclosed by Burroughes, in the light emitting device of Burrows-Tsutsui-Kwong in order to in order to improve the conditions for the charge injection into and change recombination in the emissive layer, thereby providing a significant increase in device efficiency.

Regarding Claim 58, Burrows-Tsutsui-Kwong-Burroughes teaches the tri-layer of a fluoride/metal/metal is LiF/Al/Mg (LiF/Mg/Al, Pages 3-5). The significance of Mg and Al locality is irrelevant as both are metals.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hana A. Sanei whose telephone number is (571) 272-8654. The examiner can normally be reached on Monday- Friday, 9 am - 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimeshkumar D. Patel can be reached on (571) 272-2457. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

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